

Prof. Edward D. Cope, at Philadelphia, on April 12, 1897, æt. 56.

Dr. Traill Green, at Easton, Pa., on April 29, 1897, æt. 83.

Mr. George W. Biddle, at Philadelphia, on April 29, 1897, æt. 79.

The President was requested to appoint members to prepare biographical notices of Prof. Cope and Mr. Biddle.

The following papers were presented :

“ Australian Rock Carvings,” by R. H. Mathews.

“ On the Transitive Substitution Groups that are simply Isomorphic to the Symmetric or the Alternating Group of Degree Six,” by G. A. Milier, Ph.D.

Dr. Hays moved that after the presentation of Sir Archibald Geikie’s communication, the meeting adjourn to reconvene on Thursday evening, May 13, at 8 o’clock. Adopted.

Sir Archibald Geikie then presented a verbal communication on “ Recent Geological Work in the Hebrides and Faroe Isles,” for which the best thanks of the Society were voted to him.

The meeting was then adjourned by the President, pursuant to the resolution previously adopted.

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## AUSTRALIAN ROCK CARVINGS.

(Plate IV.)

BY R. H. MATHEWS, L.S.

(*Read May 7, 1897.*)

At a meeting of the Royal Society of New South Wales, held on the 1st of August, 1894, I read a paper on “ The Aboriginal Rock Carvings and Paintings ” in that colony, for which I was awarded the Society’s medal.<sup>1</sup> I also contributed papers on the same subject to the Anthropological Institute of Great Britain,<sup>2</sup> the Royal Society

<sup>1</sup> *Jour. Roy. Soc. N. S. Wales*, xxviii, 329, 330.

<sup>2</sup> *Jour. Anthropol. Inst.*, London, xxv, 145, 163.

of Victoria,<sup>1</sup> the Royal Geographical Society of Australia<sup>2</sup> and other learned bodies. Since then I have continued my researches, and have succeeded in discovering several other groups of native carvings not hitherto recorded, a description of which I have thought are worthy of being recorded.

In the papers above referred to I have described the way in which these carvings were executed by the native artists, their geographic range, etc., so that it will not be necessary in the following pages to again refer to these parts of the subject. The accompanying plate shows much the largest and most varied as well as the most valuable collection of rock carvings hitherto published. All the figures are drawn to scale from careful measurements and sketches taken by myself, and the position of each on the Government maps is also stated in the descriptions, so that they can readily be found by persons desirous of visiting them. As all the carvings are situated within New South Wales, it will not be necessary to add the name of the colony in the description of each figure.

#### PLATE IV. ROCK CARVINGS.

Fig. 1. This huge, roughly drawn figure of a man is carved on a table of Hawkesbury sandstone, almost level with the surface of the ground, on the old road from Peat's Ferry to Sydney, and is about half a mile northerly from Vize Trigonometrical Station, Parish of Cowan. The old dray track, now little used, passes over this figure, which has caused some of the lines to become rather indistinct.

From the feet to the top of the head measures ten feet eight inches.<sup>3</sup> Both eyes are shown and a diagonal line across the face. There is a line across the body at the waist, across each arm near the shoulder, across the left thigh, and the left ankle. An unfinished line rises from the left thigh, outside of the figure. The right hand and part of the left shoulder have been obliterated by the traffic along the road referred to.

Figs. 2, 3, 4 and 5. This group of carvings appears on a flat

<sup>1</sup>*Proc. Roy. Soc. Victoria*, vii (N. S.), 143, 156.

<sup>2</sup>*Proc. Roy. Geog. Soc. Aust. (Q.)*, x, 46-70; *ibid*, xi, 86-105.

<sup>3</sup>For other gigantic carvings of men the reader is referred to the following plates in various papers written by me on this subject: Figs. 1 and 6, Pl. 16, *Jour. Anthropol. Inst.*, London, xxv, 145-163; Fig. 5, Pl. 2, *Proc. Roy. Geog. Soc. Aust.*, Queensland, xi, 86-105; and Fig. 7, Pl. 9, *Proc. Roy. Soc. Victoria*, vii (N. S.), 143-156.

sandstone rock, about a quarter of a mile in a northwesterly direction from Taber Trigonometrical Station, Parish of Broken Bay.

There are a man and a woman in the attitude of aboriginal dancers; the man is about four feet six inches high from his feet to his hands. The head contains eyes and mouth, but no nose, and there is a belt around the waist consisting of one incised line. On the upper side of the belt, and projecting from it, are two incised lines extending upwards about five inches. Lines are also cut across the arms above the shoulder, with short lines similar to those projecting from the belt extending a few inches along the centre of each arm. The hands have four fingers and the feet four toes each. The penis is shown in this figure by a single incised line,<sup>1</sup> instead of in the way usually found in native carvings.

On the right of the man is a female figure, much smaller, without eyes or mouth. The mammæ are depicted in the manner usually employed by the Australian aborigines in their paintings or carvings of women.<sup>2</sup>

Another carving, Fig. 4 in this group, represents a male figure, which is interesting on account of the lines rising from the head, which may represent hair, or may perhaps be intended for feathers or other ornaments stuck in the hair. The hands have four fingers only, and the feet have been carried away by the weathering of the rock.

On the same rock is another of those grotesque forms, Fig. 5, which are hard to definitely identify, and may be intended either for some kind of lizard or for a human being.

Fig. 6. The large sandstone rock containing this carving is distant from Taber Trigonometrical Station about fifteen chains in a westerly direction, Parish of Broken Bay. It is on the top of the range dividing Smith Creek from Coal and Candle Creek.

This shield is four feet five inches long by two feet broad, and has a longitudinal and a transverse subdivision. In the upper right-hand quarter are four jagged holes cut in the rock, and five similar holes in the lower right-hand quarter. The upper left-hand quarter of the shield contains five similar holes and the lower left-hand quarters six,

<sup>1</sup> Compare with Fig. 4, Pl. 2, of my paper on "Australian Rock Pictures," contributed to the Anthropological Society of Washington, and published in *The American Anthropologist*, viii, pp. 268-278.

<sup>2</sup> For an interesting carving of a woman dancing, see Fig. 3, Pl. 2, *American Anthropologist*, Vol. viii, pp. 268-278.

or twenty holes altogether. These holes are not in any symmetrical design, but appear scattered irregularly over the surface of the shield, and have probably been intended for ornamentation. The ethnological collection of the Australian Museum in Sydney contains a hielaman, or shield, from Queensland which has a longitudinal line and two median horizontal lines, and is ornamented with a ground-work of red dots. On the other hand, these marks may be intended to represent the indentations made by spears.

Near this shield is a hollow, or "pot-hole," in which water collects in wet weather. Around the margin of this small pool of water are a large number of grooves or hollows worn by the aborigines in sharpening their stone tomahawks. For illustrations and descriptions of similar grinding places, see my paper on "Some Stone Implements Used by the Aborigines of New South Wales," *Jour. Roy. Soc. N. S. Wales*, xxvii, pp. 301-305, Plate 43, Fig. 3.

Figs. 7-13. These carvings are all on the same flat rock, situated within Portion No. 1140, of forty acres, in the Parish of Manly Cove. The first three are apparently intended for eels, varying in length from four feet three inches to six feet one inch. Figs. 11 to 13 are all of the same kind of fish, but of different sizes. I am unable to say definitely what fish is intended to be represented, but it has been suggested perhaps that they are grupers. The length of the smallest is two feet four inches, and that of the largest four feet two inches.

Fig. 14. This drawing, which is on the same rock as Fig. 26, represents a man about five feet eight inches high, with a boomerang lying near him. The left hand has four fingers and the right five. The distance from the right toe to the centre of the boomerang is one foot two inches, the length of the latter being two feet four inches. The end of one of the weapons shown in Fig. 60 almost touches the right foot.

Fig. 15. This well-executed figure of a buck kangaroo is carved on a large flat rock of Hawkesbury sandstone, near the southern boundary of Portion No. 717 in the Parish of Manly Cove. The drawing appears to have been intended to represent the animal bent down in the attitude of grazing. The eye, one of the ears and the mouth are shown, the latter being open, which is unusual.

Figs. 16 and 17. These carvings are found on the perpendicular face of a large sandstone rock about five yards from the left shore of Cowan Creek, about seven or eight chains above its confluence

with Cockle Creek, in the Parish of Gordon. Fig. 16 represents a fish five feet nine inches long and about two feet nine inches across the body at the widest part. This fish has two eyes and three small dots about two feet three inches from the point of the nose, which are perhaps intended to represent gills. The tail is divided by two curved lines extending from the back to the belly. Within the outline of the larger fish there is a small one about eighteen inches long by eight and a half inches across the body. There are six representations of boomerangs, the most I have yet observed in so small a space, three of them being within the outline of the large fish, two partly within and one outside of the said outline.<sup>1</sup>

Ten feet five inches farther to the right from the nose of the large fish, on the vertical face of the same rock, are two small animals, Fig. 17, which are probably intended to represent kangaroo rats, judging by their size and general aspect.<sup>2</sup> They are each about one foot four inches in length, and are fairly well executed.

The side of the rock on which the figures are cut faces north-easterly, or towards Cowan Creek. These carvings are somewhat uncommon on account of being executed on the face of a vertical rock, such drawings being generally found on horizontal surfaces; they are, however, sometimes met with on rocks occupying different slopes between the two positions mentioned.

Fig. 18. This curious drawing is on the same flat rock as Fig. 26, and is probably intended to represent a fish, real or imaginary.<sup>3</sup> It is five feet three inches in length.

Fig. 19. This figure of a wallaby is on the eastern continuation of the same rock as Fig. 26, but is on the Government road separating Portions Nos. 1139 and 1140 before referred to. The length of the wallaby from the tip of the nose to the end of the tail is four feet five inches; it is in the attitude of jumping, and the eye is shown.

<sup>1</sup> Three feet seven inches to the left of the tail of the larger fish is the carving of an iguana six feet long which is shown as Fig. 11, Pl. 3, of my paper on "The Aboriginal Rock Pictures of Australia," *Proc. Roy. Geog. Soc. Aust.*, Queensland, Vol. x, pp. 46-70.

<sup>2</sup> Kangaroo-rats are represented in Figs. 13 and 14, Pl. 99, illustrating my paper on this subject in the *Report of the Australasian Association for the Advancement of Science*, Vol. vi, pp. 624-637.

<sup>3</sup> For other examples of nondescript or monstrous creatures drawn by the aborigines the reader is referred to Fig. 6, Pl. 2, *Proc. Roy. Geog. Soc. Aust.*, Queensland, Vol. xi, pp. 86-105; Fig. 10, Pl. 9, *Proc. Roy. Soc. Victoria*, Vol. vii (N. S.), pp. 143-156.

Fig. 20. This figure, which is three feet eleven inches high and on the same rock as Fig. 26, is probably intended to represent a boy. The correct number of fingers is shown on each hand.

Fig. 21. This remarkable carving is on a large, flat rock of Hawkesbury sandstone on the western side of the road from Pymble to Pittwater, within Portion No. 23 of 320 acres in the Parish of Narrabeen.

The drawing represents a man with a weapon in his left hand, which is raised over his head. It is not clear whether the weapon is a nullanulla or a tomahawk, resembling one as much as the other. This carving is one of unusual interest, as it shows what appears to have been intended for a breast on the left side, as if the native artist had at first intended to draw a figure of a woman and had afterwards changed his mind. Or it may have been drawn to represent a dilly bag carried by a string over the right shoulder, with the bag hanging under the left arm. Again, it may have been intended to show some deformity which existed in the man it was designed to represent; or perhaps the intention was to delineate some real or legendary personage having the characteristics of both sexes.

The head contains eyes, but no other features; the feet are drawn in the usual way, but the hands are not shown. From head to foot the man stands five feet eight inches high. The rock on which this figure is carved slopes gently towards the southwest, and the bearing of the figure from feet to head is N. 50° E.

Fig. 22. This figure of a man five feet eight inches high is on the same rock as Fig. 26. The eyes and mouth are shown, and the hands have each only four fingers.

Fig. 23. This figure of a woman, one foot seven inches high, is drawn on the same rock as the last described. The hands and feet are omitted, but the paps are shown as in other carvings of females delineated on this plate. This figure is interesting on account of the comparative smallness of its size.

Fig. 24. This figure of a man six feet high is on the same flat rock as Fig. 15. The fingers are shown on the right hand, but not on the left. On the left side of the head and coming partly within it is a shield one foot nine inches long and five inches wide, with a bar across it near the middle. The penis of this figure is drawn in an unusual style, showing the foreskin.

Fig. 25. This human figure is three feet three inches high, and although the sex is not shown I am inclined to think it is intended



to represent a young girl. I have arrived at this opinion by comparing it with Fig. 23 on the same rock and with Fig. 36 in a different locality. It may also be compared with Fig. 11 Plate 9, of my paper on "Aboriginal Rock Paintings and Carvings in N. S. Wales," published in the *Proceedings of the Royal Society of Victoria*, vii, N. S., pp. 143-156.

Fig. 26. This carving is delineated on a flat rock of Hawkesbury sandstone sloping northerly, within Portion No. 1139 of twenty-four and one-half acres in the Parish of Manly Cove. This drawing is apparently intended to represent the wombat, an Australian animal with a very short tail and heavy body. Like many other native drawings, the animal is shown much larger than the natural size. From the point of the nose to the end of the tail it measures nine feet eight inches, and across the body at the widest part it is four feet. The plate shows the figure exactly as it appears upon the rock, the usual careful measurements having been taken. Within the outline of this carving is what appears to be a snake three feet six inches long.<sup>1</sup>

Fig. 27. This carving, which probably represents a shark,<sup>2</sup> is on the same rock as Fig. 26, and is eleven feet long. There are two dorsal and one ventral fin and a fairly good tail. The nose of this fish is very pointed, a peculiarity I have observed in other native drawings. Near the mouth is a boomerang one foot eight inches long, on the concave side of which is a small oval figure. Farther on towards the tail of the fish are two other oval figures of larger size, but I am at present unable to suggest what they are intended to represent—they might conceivably be meant for eggs.

Fig. 28. This figure is on the same rock as Fig. 61, and represents a man four feet four inches high. Contiguous to his right hand are two oval figures about a foot long and nine inches across, which may have been intended to represent shields, or possibly the eggs of a bird. A similar object is shown in Fig. 61.

Fig. 29. This group of carvings is situated on the horizontal surface of several large tabular masses of Hawkesbury sandstone, all in

<sup>1</sup> This carving is shown as Fig. 14, Pl. 3, in my paper on "The Aboriginal Rock Pictures of Australia," in *Proc. Roy. Geog. Soc. Aust.*, Qld. Bch., Vol. x, pp. 46-70.

<sup>2</sup> An immense fish carved on a rock by the aborigines is shown in Fig. 15, Pl. in my paper on "Aboriginal Rock Paintings and Carvings in N. S. Wales," published in *Proc. Roy. Soc. Victoria*, Vol. vii (N. S.), pp. 143-156.

close proximity to each other on the western side of the cleared road leading from Pymble along the dividing range between Cowan and Cockle Creeks, about half a mile southerly from "Bobbin" Trigonometrical Station, in the Parish of Gordon.<sup>1</sup>

The largest emu<sup>2</sup> is six feet three inches from the beak to the end of the tail, and is five feet high, in the attitude of looking for food or at something on the ground; and although the neck is rather too short, it is a very fair picture of an emu. Only one leg is delineated, and the foot is shown in continuation of the leg.

The other emu, which is much smaller, measures three feet two inches from the beak to the tail, and stands three feet five inches high. In this drawing the eye has been added, and one leg with its foot is delineated in the same way as that of the large emu.

Between the last two birds is a small one, fifteen inches from tail to head, and fourteen inches from pinion to pinion. Were it not for the presence of wings and the shortness of the neck and legs we might suppose this to be intended for a young emu to complete the picture. As it is, however, it appears to represent some bird upon the wing.

Fig. 30. This carving is also on the continuation of the same flat rock which contains Fig. 29. The figure measures two feet four inches in extreme length, one foot two inches across the fore feet and one foot four inches across the hind feet. The head is four inches long and the tail nine inches. This drawing appears to be intended for a flying squirrel, as it resembles that animal more

<sup>1</sup>Besides Figs. 29 to 37, inclusive, shown in this plate and now described, there are on the same cluster of rocks some other carvings which are described by me elsewhere, the positions of which are as follows: About five paces from the snout of Fig. 31 is a group representing a man and woman in the attitude of dancing. Near them is a native "dilly bag" and several human footmarks cut into the rock. For a description of this group of carvings see my paper on "Aboriginal Rock Paintings and Carvings in N. S. Wales," published in *Proc. Roy. Soc. Victoria*, Vol. vii (N. S.), pp. 143-156, Pl. 9, Fig. 8.

About twenty-five or thirty paces in a southwesterly direction from the last-mentioned carvings is another group representing two men and two emus. For a drawing of this group, see Fig. 3, Pl. 2, in my paper on the "Rock Pictures of the Australian Aborigines," published in the *Proceedings of the Royal Geographical Society of Australasia*, Queensland, Vol. xi, pp. 86-105.

<sup>2</sup>A group of six emus are represented in Fig. 1, Pl. 2, in my paper on "Australian Rock Pictures," published in *The American Anthropologist*, viii, 268-278.



closely than any other I can compare it with. It may, however, be intended to represent some bird.

Fig. 31. This figure is delineated on the same flat rock of Hawkesbury sandstone as Fig. 29. It measures four feet five inches from the point of the nose to the tip of the tail; the head contains an eye, and there is also a dot on the ear, apparently to indicate the hollow part of it. I submit that this is intended to represent an opossum,<sup>1</sup> because the portion of the body is more horizontal than in figures of kangaroos and kangaroo-rats, in which the fore part of the body is always more or less elevated. The position of the tail, pointing slightly upwards, also strengthens the supposition that it is an opossum.

Fig. 32. This carving is on a flat rock of Hawkesbury sandstone, not far from the last-described carving, and appears to be intended to delineate a bird on the wing,<sup>2</sup> but it is difficult to suggest what bird is the likeliest to be indicated, and in trying to arrive at a definite conclusion the forked tail should not be lost sight of. From the extremity of one wing to that of the other measures three feet, and the total length from the head to the end of the tail is one foot eleven inches. It is well known that the natives had animals and birds as totems; among these may be mentioned the eagle hawk, the crow, the white cockatoo, the emu, the kangaroo and so on.

Fig. 33. This peculiar carving is executed on the same group of flat rocks as the preceding, and delineates the lower part of the body of a man, from the waist downwards, the knees being bent outwards, with the feet also in the same direction. From the outside of one knee to the outside of the other measures three feet eight inches. The figure may have been intended to indicate that the man was sitting on the rock, the rest of the body being upright and not shown; or perhaps it was intended to convey the idea that the rest of the man's body had gone into the rock, leaving this part protruding. I have seen similar figures carved upon rocks, but they are uncommon,<sup>3</sup>

<sup>1</sup> For another carving of an opossum see Fig. 7, Pl. 3, *Proc. Roy. Geog. Soc. Aust.*, Queensland, p. 67.

<sup>2</sup> For carvings of birds on the wing the reader is referred to Fig. 2, Pl. 99, illustrating my paper on "Rock Paintings and Carvings of the Aborigines of New South Wales," published in the *Report of the Australasian Association for the Advancement of Science*, Vol. vi, pp. 624-637.

<sup>3</sup> For a similar carving see Fig. 10, Pl. 2, attached to my paper on "Rock Pictures of the Australian Aborigines," *Proc. Roy. Geog. Soc. Aust.*, Queensland, Vol. xi, pp. 86-105.

Fig. 34. This small figure is also on the same line of rocks as Fig. 31. It is one foot seven inches high, and the same distance from hand to hand. The head is rather bird-shaped, and has an eye; there are incised curved lines reaching from the arms to the head on each side, the meaning of which I am unable to suggest.

This figure is most likely intended to denote a "piccaninny" or young aborigine, because there was room on the rock to draw a much larger figure if it had been desired. We frequently, I might say mostly, find figures of men drawn in caves which are not larger than this, but in such cases the small-sized figures are chosen on account of want of room on the cave walls.<sup>1</sup>

Fig. 35. This carving is on a continuation of the same flat rock as Fig. 31 and is another of those objects found in aboriginal drawings the precise identity of which it is difficult to arrive at. It is probably intended for the echidna<sup>2</sup> or porcupine, but I would, however, throw out the suggestion that it may be intended to represent a dilly bag. Some color is lent to this view from the lines drawn across it; the dot, which may represent the eye, is, however, against the latter theory.

Fig. 36. This carving is delineated on the continuation of the same flat rocks as the preceding, and represents a female two feet seven inches high and about the same distance across from hand to hand.<sup>3</sup> The arms are very long for the size of the body, and there are four fingers on each hand, but the feet are not shown. In the centre of the head is a small hole or dot, and there are two similar holes on the chest, but whether they were put there by the native artist or are merely water-worn indentations in the rock is uncertain. Above the figure there is a bird-like object which at the nearest points is two and a half inches from the head. This may be intended as an ornament to the head, or it may be where some other figure has been commenced and abandoned. The breasts are drawn in the usual way adopted by native artists, and there is a short incised line apparently intended to represent the *pubes*.

<sup>1</sup> A few feet from this figure is a carving of an iguana seven feet two inches long, shown as Fig. 9, Pl. 9, *Proc. Roy. Soc. Victoria*, Vol. vii (N. S.), p. 153.

<sup>2</sup> For similar carvings see Figs. 11 to 17, Pl. 2, *American Anthropologist*, viii, 276.

<sup>3</sup> For a colossal carving of a woman nearly twelve feet tall, the reader is referred to Fig. 2, Pl. 16, of my paper on "The Rock Paintings and Carvings of the Australian Aborigines," *Jour. Anthropol. Inst.*, London, Vol. xxv, pp. 145-163.

Fig. 37. This carving is also on the same flat rocks as Fig. 31. It is evidently intended to represent a male, probably a youth. It has the same bird-like head as Fig. 34, a form not uncommon in native carvings. The legs are short, but the termination of them is well defined, showing that they were originally drawn as they now appear. Near the extremity of one of the legs is a small unfinished drawing eight inches long by two inches wide.

Fig. 38. This large fish, apparently intended for a shark, is delineated on the same rock as Fig. 15; it is fourteen feet four inches long and three feet nine inches across the widest part of the body, not including the fins. It has a pointed nose like Fig. 27 and otherwise closely resembles that fish.<sup>1</sup>

Fig. 40. This interesting carving is delineated on the same rock on which Fig. 26 appears and represents a fish two feet nine inches long and one foot across the body at the widest part. It has a dorsal and a ventral fin and a small, well-formed tail. An incised line, similar to that marking the outline of the fish, extends from its mouth for about five feet six inches along the rock.<sup>2</sup> This is evidently intended as the picture of a fish caught on a line.<sup>3</sup>

Fig. 41 consists of a circular figure with a winding lind extending from it to another figure one foot six inches long and six inches wide. Within the former is one of those oval objects referred to in Fig. 27. Both this and the preceding carving, Fig. 40, are on the same flat rock as Fig. 26.

Figs. 39, 42 and 43. Fig. 43 I am unable to offer any explanation of at present. Fig. 39 are no doubt intended either for human hands or the paws of some animal.<sup>4</sup> The upper one has three fingers, the lower one four, each having a thumb in addition. Fig. 42 is, in my opinion, a human hand with part of the arm attached, and not

<sup>1</sup> The reader is referred to my paper on "The Rock Paintings and Carvings of the Australian Aborigines," *Journ. Anthropol. Inst.*, xxv, pp. 145-163, Pl. 16, Fig. 7, for a carving of a very large shark, 33 feet 10 inches in length.

<sup>2</sup> For a similar carving of a fish caught on a line see Fig. 13, Pl. 2, illustrating my paper on "The Rock Pictures of the Australian Aborigines," *Proc. Roy. Geog. Soc. Aust.*, Queensland, Vol. xi, pp. 86-105.

<sup>3</sup> Collins says he saw the natives of New South Wales fishing with a hook and line. The line was made of the bark of a small tree, and the hooks of the pearl oyster shell, which they rubbed on a stone until it assumed the shape desired.—*Account of the English Colony in N. S. Wales*, 1798, Vol. i, pp. 556-557.

<sup>4</sup> For a similar hand see Fig. 1 (g), Pl. 2, *Proc. Roy. Geog. Soc. Aust.*, Queensland, Vol. xi, pp. 86-105.

a foot, as might be supposed at first sight. Compare with representations of feet in Fig. 61.

Figs. 44 to 47. On the same rock as Fig. 26 are representations of fish of different sizes, ranging in length from two feet two inches to six feet. Six inches from the mouth of Fig. 45 are two lines crossing each other, one being ten inches long, the other five.

Fig. 48. This figure of a man five feet nine inches high appears on the same rock as Fig. 61 and is close to it. The eyes, mouth, and the proper number of fingers are delineated, as well as a belt round the waist. A small oval figure, similar to those seen in Fig. 27, appears close to the belt on the right-hand side.

Fig. 49. This appears to me to be part of a shield, which was left when half finished. It is two feet five inches long and ten inches wide. It is on the same rock as Fig. 47 and is close to it.

Fig. 50. This interesting drawing of a fish four feet six inches long appears on the same flat rock as Fig. 15. There are two dots for the eyes, on the same side of the head, a peculiarity of native drawing frequently seen in representations of fish.

Fig. 51 is on the same rock as the preceding, and is a very good drawing of a fish four feet five inches long.

Fig. 52 represents a shield three feet six inches long and one foot eight inches wide, and is on the same rock as the last two figures. Attention is drawn to the unusual point at the end.

Fig. 53. This figure represents a shield four feet three inches in length and one foot nine inches in breadth, with a longitudinal and a transverse subdivision. This carving is on the same series of flat rocks as Figs. 7 to 13 and is not far from them.

Fig. 54. This drawing, which is on the same rock as Fig. 26, may have been intended to represent a fish, or perhaps the skin of some animal.

Fig. 55 is on the same rock as Fig. 26, and represents a human figure five feet one inch high, the sex of which is uncertain. Five fingers are shown on each hand.

Figs. 56 and 57. Fig. 56, which is eighteen inches long, is apparently intended to represent the native tomahawk, with handle attached. Fig. 57, which is one foot nine inches long, may be either a nulla nulla or a tomahawk. These figures are carved on a mass of Hawkesburg sandstone more than an acre in extent, about five chains from the eastern side of the old road from Peat's Ferry to Sydney, and about a mile northerly from the rock containing Fig. 1.

Fig. 58. This large fish is carved on the same mass of sandstone as Fig. 1, but several yards farther south, and close to the old dray track. It measures twenty feet five inches from the snout to the farthest end of the tail, and thirteen feet from point to point of the fins. Across the larger of the fins, which appears to be the dorsal, is an incised line, such as is frequently met with on the bodies of different animals drawn by the aborigines. The two eyes are shown on the same side of the head, a mode of representing the eyes often observed in native pictures. The greatest width of the body, independently of the fins, is eight feet.<sup>1</sup>

Fig. 59. This representation of an eel is three feet four inches long, and five inches across the widest part of the body; from point to point of the fins measures seven inches. There are four bands or lines across the body. It is carved on the same flat rock as Figs. 56 and 57. For other carvings of eels, see Figs. 7, 8 and 9 of this plate.

Fig. 60. It is difficult to arrive at a definite conclusion as to what these figures are intended to represent. One is ten feet long, the other twelve, and they each have an average width of three inches. They occupy a position on the rock very close to Fig. 14, the end of them almost touching the right foot of the latter. Perhaps they represent spears or yamsticks; or were possibly intended for large snakes.

Fig. 61. This interesting carving is on a flat rock of Hawkesbury sandstone with Portion No. 796 of 9 ac. 2 r. 3 p., Parish of Manly Cove. It represents a man six feet high, with a belt round the waist and bands round the arms near the shoulder, similar to those seen in Fig. 1. Within the outline of the body is a very good representation of a human foot, twelve inches long, four inches across the toes, and three inches across the heel.<sup>2</sup> About three feet behind the heel of the last-mentioned figure is another human foot, not so perfect as the first, twelve inches long and having only four toes. Eleven inches farther away in the same direc-

<sup>1</sup> For a monstrous carving of a shark, nearly thirty-nine feet long, see my paper on "The Rock Paintings and Carvings of the Aborigines of N. S. Wales," published in *Rep. Australas. Assoc. Adv. Sci.*, vi, pp. 624-637, Pl. 99, Fig. 30.

<sup>2</sup> Human footmarks carved on rocks are represented in Fig. 8, Pl. 9, illustrating my paper on "Aboriginal Rock Paintings and Carvings in New South Wales," published in the *Proceedings of the Royal Society of Victoria*, Vol. vii (N. S.), pp. 143-156.

tion is an oval object, but what it is intended to represent I am at present unable to offer an explanation. The two last-described figures are shown in their relative positions to each other, but are not so in reference to the man. They are shown above the head of the latter on the plate to fill out a vacant space, but a careful reading of this description will indicate their true position.

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ON THE TRANSITIVE SUBSTITUTION GROUPS  
THAT ARE SIMPLY ISOMORPHIC TO  
THE SYMMETRIC OR THE ALTERNATING GROUP  
OF DEGREE SIX.

BY G. A. MILLER, PH.D.

(*Read May 7, 1897.*)

When the degree of a symmetric or an alternating group is not 6 we can obtain all the simple isomorphisms of the group to itself by transforming it by means of the substitutions of the symmetric group of the same degree. In other words, we can construct only one intransitive group of degree  $mn$  and order  $n!$  or  $n! \div 2$ , whose  $m$  transitive constituents are respectively the symmetric or the alternating group of degree  $n$ ,  $n \neq 6$ .<sup>1</sup> Hence the number of transitive substitution groups that are simply isomorphic to the symmetric group of degree  $n$  ( $n \neq 6$ ) is equal to the total number of substitution groups (transitive and intransitive) that can be constructed with  $n$  letters and whose order is less than  $n! \div 2$ , while the number of those that are simply isomorphic to the alternating group of this degree is equal to the number of all the other positive groups that can be constructed with  $n$  letters.<sup>2</sup>

As nearly all the groups that can be constructed with  $n$  letters are subgroups of larger groups that do not involve the symmetric or the alternating group of degree  $n$  and whose degree  $< n + 1$ , the transitive substitution groups that are simply isomorphic to the

<sup>1</sup> Hölder, *Mathematische Annalen*, Vol. xlvi, pp. 340, 345; cf. Miller, *Bulletin of the American Mathematical Society* (1895), Vol. i, p. 258.

<sup>2</sup> Dyck, *Mathematische Annalen*, Vol. xxii, p. 90; cf. Miller, *Philosophical Magazine* (1897), Vol. xliii, p. 117.